The diagnostic work-up of stable chest pain at a large university teaching hospital

G Sen; R Wheeler

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Introduction

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The diagnostic work-up of stable chest pain at a large university teaching hospital

Dr Gautam Sen, MB BCh, BSc (Hons)
Foundation Trainee
Royal United Hospital, Bath

Dr Richard Wheeler, MBChB, MRCP
Consultant Cardiologist
University Hospital Wales, Cardiff

Address for Correspondence:
Dr Gautam Sen: gautamsen@nhs.net

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Background

Coronary artery disease (CAD) is the commonest cause of death in the UK: one in five men and one in seven women die from the disease.[1,2] The problem continues to rise with an increasing prevalence of obesity and physical inactivity.[3] The commonest clinical manifestation of CAD is chest pain, with 20%-40% of the population experiencing chest pain.[4]

The working definition of angina is a *"symptom of myocardial ischemia without necrosis that is recognized clinically by its character, location and precipitating factors".*[2,4] Patients suffering with chest pain experience a decreased quality of life, as they fear that it is a forerunner of a myocardial infarction.[4] In spite of the simplistic definition above, diagnosing angina is not easy, as chest pain is not unique to angina with musculoskeletal, gastrointestinal and psychiatric causes making up a large proportion of other causes of chest pain.[5,6,7,8] Therefore the clinical challenge is to accurately identify the patients with CAD in order to prevent adverse events but also to limit unnecessary investigations.

Aims

The aim of the audit was to compare the assessment of stable chest pain at the University Hospital Wales (UHW), Cardiff with the NICE guidelines.

NICE guidelines

The recently published guideline from NICE: Chest Pain of Recent Onset (2010)[2] describes a new model for the assessment of stable chest pain.

The guidlines state that anginal pain is:

1. Constricting discomfort in the front of the chest, or neck, shoulders, jaws or arms.
2. Precipitated by physical exertion.
3. Relieved by the rest or glyceryl trinitrate (GTN) with in five minutes.
   - Three of the features above are defined as atypical angina.
   - Two of the three features above are defined as atypical angina.
   - One or none of the features above is defined as non-anginal chest pain.

Using this categorisation, the patient can be grouped into a NICE risk group depending on the patient's type of chest pain, sex, age and other cardiovascular risk factors (Table 1).[2]

Percentage of people estimated to have coronary artery disease according to typicality of symptoms, age, sex and risk factors[2]

Age (years)	Non-anginal chest pain				Atypical angina				Typical angina			
	Men		Women		Men		Women		Men		Women	
	Lo	Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo	Hi
35	3	35	1	19	8	59	2	39	30	88	10	78
45	9	47	2	22	21	70	5	43	51	92	20	79
55	23	59	4	25	45	79	10	47	80	95	38	82
65	49	69	9	29	71	86	20	51	93	97	56	84

For men older than 70 with atypical or typical symptoms, assume an estimate > 90%.
For women older than 70, assume an estimate of 61–90% EXCEPT women at high risk AND with typical symptoms where a risk of > 90% should be assumed.

Values are per cent of people at each mid-decade age with significant coronary artery disease (CAD).
Hi = High risk = diabetes, smoking and hyperlipidaemia (total cholesterol > 6.47 mmol/litre).
Lo = Low risk = none of these three.
The shaded area represents people with symptoms of non-anginal chest pain, who would not be investigated for stable angina routinely.
Note: These results are likely to overestimate CAD in primary care populations.
If there are resting ECG ST-T changes or Q waves, the likelihood of CAD is higher in each cell of the table.

Table 1: Percentage of people estimated to have coronary artery disease in relation to their symptoms and risk factors

Depending on their risk, the patient should be sent for further investigations (Table 2).[2]

Investigations according to NICE CAD category	
Risk of CAD	**Investigations recommended by NICE**
<10%	Alternative diagnosis/non cardiac
10-29%	Computed tomography calcium scoring (CS)
30-60%	Functional non-invasive imaging
61-90%	Invasive coronary angiogram (CA)
>90%	Treat as coronary artery disease

Table 2: NICE recommendations of investigations according to CAD risk

Method

Data was collected retrospectively from patients (n = 299 patients) who had coronary angiograms (CAs) during the period of 12/01/2010 - 09/09/2011. From this cohort only patients who met the criteria for the audit were included (n = 178) (Table 3).

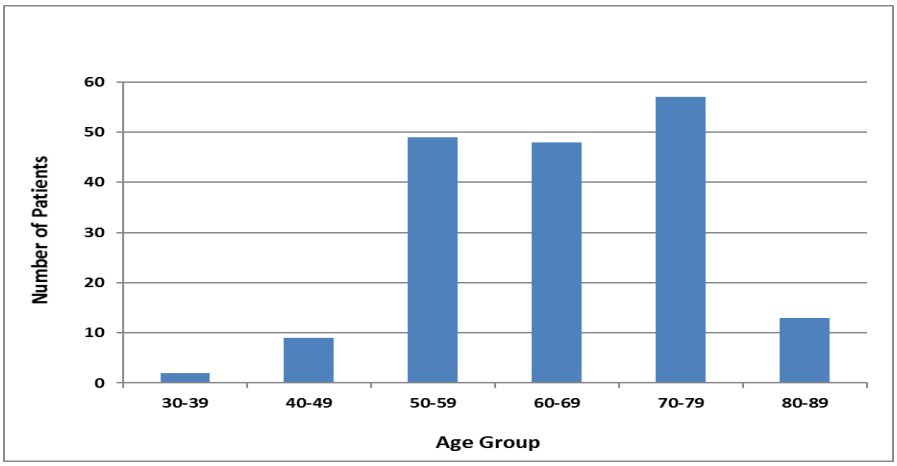
Inclusion criteria	Exclusion criteria
All patients presenting to cardiology outpatients department with: • New onset stable chest pain where angina is suspected • Patients with known angina who now have limiting symptoms	• Acute myocardial infarction • Known cardiomyopathy • Known or suspected valvular disease • Known or suspected arrhythmias • Percutaneous coronary intervention cases

Table 3: Inclusion and exclusion criterias for patients included in our study

Using clinic letters, every patient's clinical journey from their outpatient appointment to angiogram was recorded. Data was gathered from their outpatient appointment, including information about their history and cardiovascular risk factors. Data on the history included their description of chest pain, thereby classifying the pain into typical, atypical or non-anginal. The presence of risk factors were recorded; out of which three risk factors: smoking, diabetes and dyslipidaemia were deemed the most important, the presence of any one of them classifying a patient into a high-risk category. Using the NICE guidelines, an estimate of the percentage clinical risk was calculated for each patient (Table 1). Following CAD risk probability calculation, the subsequent chosen investigation by the clinician for each patient was compared with NICE recommendation as per guidance.

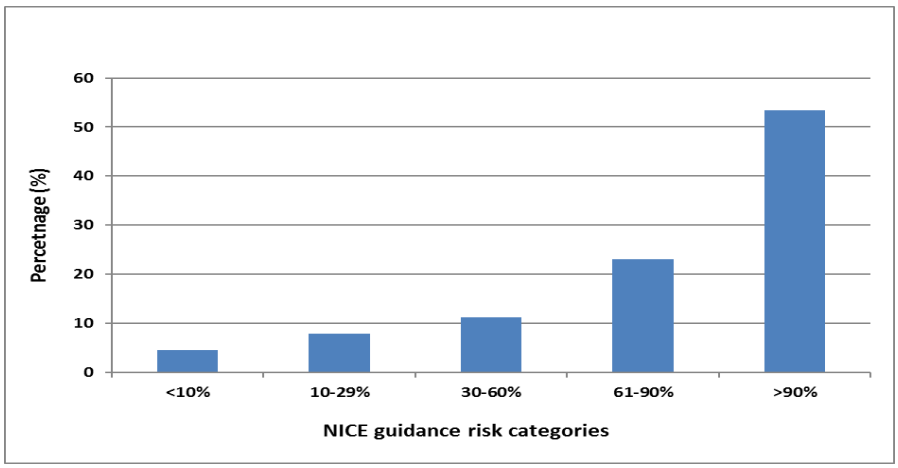
Results

In total 178 patients were included in the study. The age range of patients was 37-88 years (median 65) (Graph 1). More than half of the patients were male (61%).



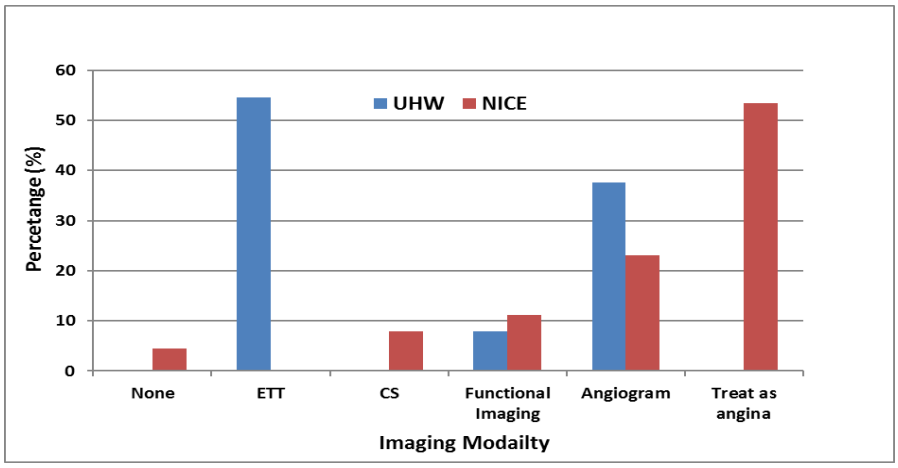
Graph 1: Age distribution of patients included in the study

According to NICE, the majority of patients fell into the >90% risk category, with less than 5% with a risk of less than 10% (Graph 2).



Graph 2: CAD risk stratification (in accordance to NICE risk categories) of patients in our study

At the UHW, 97 (54%) had exercise tolerance testing (ETT), 14 (8%) had functional testing (stress echocardiography and myocardial perfusion scanning) and 67 (38%) had coronary angiograms (Graph 3*)*. This shows a large deviation from the NICE guidelines which recommend that ETT should not be used at all for diagnosing chest pain. According to the NICE guidelines, 4% should have had no investigations done and treated as non cardiac chest pain, 8% should have had calcium scoring, 11% functional imaging, 23% coronary angiograms and 53% should have been treated as angina (Graph 3).



Graph 3: Comparison of investigations for CAD patients performed in UHW and that which is recommended by NICE

Discussion

CAD is a major cause of death, but if diagnosed early it is manageable. The problem lies in the correct diagnosis, which needs to be highly accurate and limit superfluous investigations.

As mentioned before, the study shows that there is a large deviance between the practice at the UHW and what NICE guidelines suggest in managing CAD. There are however obvious reasons for why this is the case at the UHW.

Calcium scoring which is recommended for patients with a risk of 10-29% is currently unavailable at the UHW and instead most patients with this risk category had ETT, which the UHW feel is the closest alternative. Patients with a risk of 30-60% are recommended functional tests by NICE though few had these; instead they had an ETT or proceeded directly to angiogram. The reasons for this are due to the lack of availability of functional tests such as myocardial perfusion scanning and stress echocardiograms which are used selectively. In the 60-90% risk bracket, the majority had ETT rather than proceeding directly to angiograms as recommended by NICE. ETT again seems to be primary modality of choice.

NICE have controversially excluded ETT as a diagnostic tool citing its lack of sensitivity and specificity.[2] This differs from practice at the UHW where ETT is used for both the diagnosis and prognostication of CAD, it was the primary investigation in 54% of patients. It is used primarily because it is cheap, quick and a positive result may prevent further investigations for a patient if a diagnosis is made.[9,10] NICE however recommends functional tests rather than ETT in the majority of these cases as their sensitivity and specificity is greater. They do have a point as a large proportion of the patients who had ETT at the UHW went on to have further imaging, and therefore showing its lack of sensitivity and specificity in making a diagnosis of CAD.

The results from this study suggest that if the UHW used the NICE guidelines, there would be a significant impact in the way CAD is managed. The majority (76%) of patients fall within the boundaries of 60-100% CAD risk and are therefore eligible for invasive investigation from the outset. These results suggest that implementation of the NICE guidelines will therefore result in an increased number of patients requiring highly specialised investigations and a much greater need for coronary angiograms. Angiograms are the gold-standard for diagnosing CAD and the majority of patients are likely to eventually need an angiogram to see the extent of severity of CAD, however they are expensive, invasive and often not available straight away except to high risk patients. If the NICE guidelines are followed, increased training, increased numbers of cardiologists and a larger number of angiograms suites will be required, all requiring a financial input.

Limitations of the study

- Clinician's skill at taking a history categorises chest pain into typical, atypical and non-anginal
- Study done in a limited geographical area, limited to one hospital
- Data collected retrospectively

Future recommendations

- Study including all patients investigated for chest pain (not just the patients who had angiograms)
- Larger sample size

Conclusion

Following NICE guidelines, there is no role for ETT in the assessment of chest pain with functional imaging and coronary angiograms the main investigations. The pragmatism of this is however questionable with ETT being relatively inexpensive and requiring little training to operate compared to functional imaging. If the NICE guidelines were followed it would require a dramatic change in how chest pain is being assessed and would need a huge investment in equipment and staff.

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